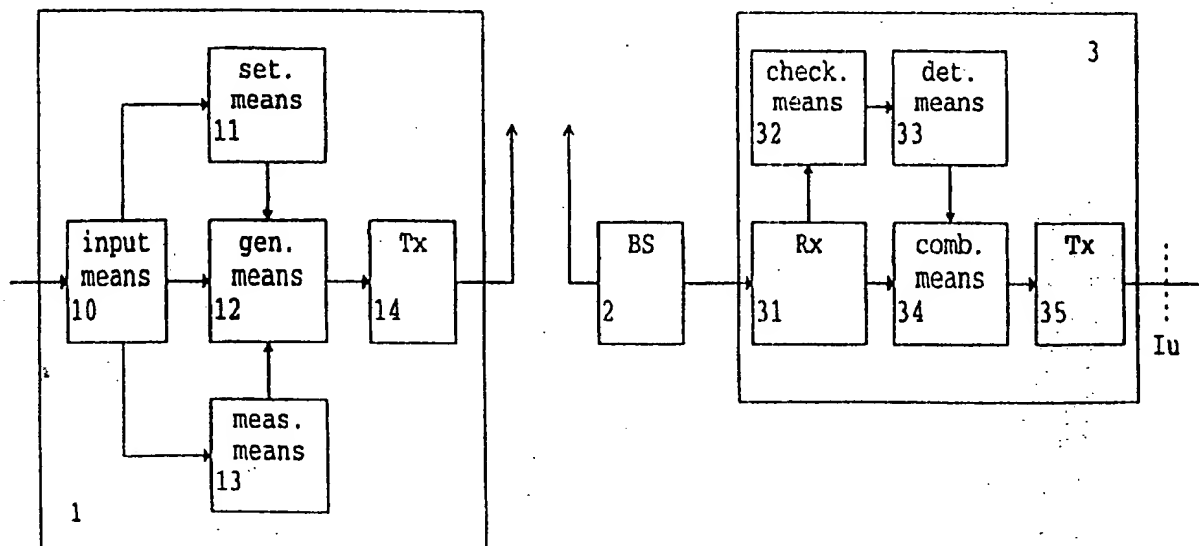




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<p>(21) International Application Number: PCT/EP98/08065</p> <p>(22) International Filing Date: 10 December 1998 (10.12.98)</p> <p>(71) Applicant (for all designated States except US): NOKIA NETWORKS OY [FI/FI]; P.O. Box 300, FIN-00045 Nokia Group (FI).</p> <p>(72) Inventors; and</p> <p>(75) Inventors/Applicants (for US only): VIALEN, Jukka [FI/FI]; Tyrskykuja 3 b 13, FIN-02320 Espoo (FI). AHMAVAARA, Kalle [FI/FI]; Nokia Telecommunications OY, P.O. Box 300, FIN-00045 Nokia Group (FI).</p> <p>(74) Agent: PELLMANN, Hans-Bernd; Tiedtke-Bühling-Kinne, Bavariaring 4, D-80336 München (DE).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YI, ZW. ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FR, GE, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NI, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>

(54) Title: METHOD AND SYSTEM FOR TRANSMITTING A POSITION INFORMATION



(57) Abstract

A method and system for transmitting a position information from a mobile terminal of a mobile communication network via network element (3) to a network node, wherein a control information indicating the requirement of a position information of the mobile terminal (1) at the network node is set in the radio interface message. This control information is checked at the network element (3) to whether a position information has to be forwarded or not. The position information is determined at the network element (3) and may be combined with a higher layer information so as to generate a complete higher layer information to be forwarded to the network node. Thereby, a position information can be supplied to the network node without substantially increasing overhead and processing power required for the radio interface message.

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Method and system for transmitting
a position information

5

FIELD OF THE INVENTION

The present invention relates to a method and system for
10 transmitting a position information from a mobile terminal of
a mobile communication network such as a UTRAN (UMTS Radio
Access Network) via a network element to a network node such
as an SGSN (Serving GPRS Support Node) of the GPRS (General
Packet Radio Service) or an MSC (Mobile Switching Center) of
15 the GSM (Global System for Mobile Communications) or their
equivalents in the UMTS (Universal Mobile Telecommunications
System).

BACKGROUND OF THE INVENTION

20

Third generation mobile telecommunications systems aim at
providing end-users, apart from terminal and personal
mobility, with enhanced services. Compared to second
generation systems, enhancement that will cover features all
25 the way between the end-user and core network elements are
required, i.e. from mobile terminals to radio access and
fixed networks.

Fig. 1 shows a mobile communication system such as a UMTS
30 system, wherein a UTRAN system is connected to a GPRS-based
core network and to a GSM-based core network. According to
Fig. 1, a mobile station (MS) 1 is radio-connected to at
least one base station (BS) 2 which is connected to a Radio
Network Controller (RNC) 3 of the UTRAN. In Code Division
35 Multiple Access (CDMA) based systems, the MS 1 can be

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connected to several BS 2 simultaneously due to macrodiversity.

The RNC 3 is connected to a mobile switching center (MSC) 5 of the UMTS or GSM core network which provides access to a circuit-switched network such as a Public Switched Telephone Network (PSTN) 8 or to a packet-switched network such as the Internet 9.

10 Additionally, the RNC 3 is connected to an SGSN 6 of the UMTS or GPRS core network. The SGSN 6 is connected to a Gateway GPRS Support Node (GGSN) which provides access to the Internet 9.

15 Thus, the RNC 3 is connected to two non-coordinated core network nodes which may both establish an active connection with the MS 1.

In the GSM system, a cell information field in the A-
20 interface between a Mobile Switching Center (MSC) and a Base Station Controller (BSC) is bound to certain radio interface messages, called initial layer 3 messages. However, these radio interface messages do not comprise any position information relating to the position of the MS 1.

25

In the UMTS, the MS 1 may be connected via the RNC 3 of the UTRAN 4 to an independent core network node (CN node) such as the MSC 5 or the SGSN 6. In this case, new services of the CN node may require a position information of the MS 1 for an
30 individual setup of the service.

Moreover, it is possible to use one RRC (Radio Resource Control) connection to two independent higher layer connections (connections at Mobility Management (MM) level or
35 connections at Connection Management (CM) level) of

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corresponding CN nodes. However, if another service is already provided to the MS 1, the UTRAN 4 does not automatically insert a position information when forwarding the service setup to the CN node, when existing GSM methods are used.

Thus, a mechanism is required to indicate to the RNC 3 that a higher layer protocol data unit (PDU) received from the MS 1 is an initial layer 3 message that should be sent as a complete layer 3 message including an additionally required MS position information to the CN node even if an active connection to the other CN node exists. In addition, the same mechanism can be used for non-initial layer 3 messages if the MS position information needs to be included therein, e.g. in case of a setup of an additional service.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to provide a method and system for transmitting a position information from a mobile terminal of a mobile communication network via a network element to a network node requiring the position information of the mobile terminal.

This object is achieved by a method for transmitting a position information of a mobile terminal of a mobile communication network to a network node using an intermediate network element, comprising the steps of: setting a control information in a radio interface message, which indicates the requirement of the position information of the mobile station at the network node, transmitting the radio interface message to the network element, checking the control information at the network element, and

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determining and forwarding the position information to the network node in response to the result of the checking step.

Furthermore the above object is achieved by a system for transmitting a position information of a mobile terminal of a mobile communication network to a network node using an intermediate network element,

wherein said mobile terminal comprises:

5 setting means for setting a control information in a radio interface message, which indicates the requirement of a position information of the mobile station at the network node, and

transmitting means for transmitting the radio interface message to the network element, and

15 wherein the network element comprises:

checking means for checking the control information; and determining means for determining the position information in response to the checking result of the checking means.

20 Accordingly, since a control information is added to the radio interface message, this parameter can be used at the RNC 3 to determine whether a position information should be forwarded to the core network through the corresponding Iu interface.

25 Thereby, the protocol amendments and additionally required information at the RRC level can be kept short so as to minimize message overhead transmitted via the radio interface.

30 An additional advantage arises when the position of the MS 1 can be detected more accurately than the cell level at the RNC 3 and new services need such an accurate position information. Then, only a short control information has to be transmitted via the radio interface to the RNC 3 in order to

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indicate that the position information must be added before forwarding the message to the CN.

A higher layer information may be incorporated into the radio interface message at the mobile terminal, wherein the position information is combined with the higher layer information at the network element in response to the checking result. Thereby, a complete higher layer message including an additionally required MS position information can be forwarded to the network node.

Preferably the control information is provided in a control field used for signaling the requirement of the position information. This control field may have a length of one bit. Accordingly, the required additional overhead of a radio interface message can be restricted to only one bit.

Alternatively, the length of this control field may be more than one bit, if e.g. several accuracy levels of the MS position are possible.

Furthermore, a position measurement information can be incorporated at the MS1 into the radio interface message before transmission, wherein the position information may be determined at the RNC 3 on the basis of the position measurement information.

The position measurement information may also be sent from the MS to the network element, i.e. UTRAN, if no higher layer message is included. This position measurement reporting can be started either by an explicit request from the network element or it can be part of a default measurement started without explicit request from the network element.

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In case no position information is required, the higher layer information can be transmitted in a transparent mode to the network node. Thus, the determination of the MS position at the RNC 3 is restricted to those cases, where it is actually
5 required. Thereby, processing capacity is saved and unnecessary delay can be prevented.

Preferably, the network element is a radio network controller of the mobile communication network such as a radio access
10 network of the UMTS, and the network node is a mobile switching center or a serving GPRS support node.

BRIEF DESCRIPTION OF THE DRAWINGS

15 In the following, the present invention will be described in greater detail on the basis of a preferred embodiment with reference to the accompanying drawings, in which:

Fig. 1 shows a principle block diagram of a mobile
20 communication network connected to two independent core networks,

Fig. 2 shows an RRC Direct Transfer message according to the preferred embodiment of the present invention,

25 Fig. 3 shows a block diagram of a radio access network according to the preferred embodiment of the present invention, and

30 Fig. 4 shows a flow diagram of a transmission control procedure according to the preferred embodiment of the present invention.

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DESCRIPTION OF THE PREFERRED EMBODIMENT

In the following, the preferred embodiment of the method and system according to the present invention will be described
5 on the basis of a mobile communication system such as the UMTS system shown in Fig. 1.

In case a connection is established between the MS 1 and one of the CN nodes MSC 5 or SGSN 6, an RRC connection is used to
10 send a corresponding higher layer PDU via the UTRAN 4. Such a higher layer message could be an MM (Mobility Management) layer message or a CM (Connection Management) layer message and is carried over the radio interface piggybacked into a radio interface message, i.e. an RRC message such as RRC
15 Direct Transfer. Since the MS 1 knows based on the MM layer or the RRC layer, whether the present higher layer message is to be carried to the CN with a position information or not, a position information control field may be provided in the RRC message.

20 Fig. 2 shows an RRC Direct Transfer message according to the preferred embodiment, which is transmitted by the MS 1 to the RNC 3. The position information control field may consist of one bit which notifies whether a position information is
25 required at the CN, or not. Alternatively, the position information control field may consist of more than one bit, if e.g. several accuracy levels are provided for the position information. In case the MS 1 derives from the MM or RRC layer information that the CN supplying the requested service
30 requires a position information, it sets the position information control bit in the RRC Direct Transfer message to "0". If no position information is required, the position information control bit remains "1". Of course, an opposite setting control of the position information control bit is
35 possible as well.

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In addition thereto, a position measurement report can be added to the RRC Direct Transfer message so as to be used by the RNC 3 to calculate the MS position. Alternatively, the
5 position measurement report can be a separate procedure between the MS 1 and the UTRAN 4, independent from the transmitting of the RRC Direct Transfer message.

Other contents of the RRC Direct Transfer message are a
10 message type information used to indicate the type of the RRC message, a CN identifier used as a routing information for routing the higher layer information from the MS 1 to the correct Iu interface connection, and the higher layer
information, i.e. higher layer PDU, to be transmitted to the
15 CN.

Thus, upon receiving the above described RRC Direct Transfer message, the RNC 3 can calculate the MS position and generate a corresponding Iu interface message as a complete layer 3
20 information.

In case the one bit position information control field is set to "1", the RNC 3 detects that no position information is needed at the CN and transmits the higher layer information
25 in a transparent manner over the Iu interface. In this case, a Direct Transfer Application Part (DTAP) of the layer 3 protocol at the RNC 3 is used.

Fig. 3 shows a block diagram of a radio access network such
30 as the UTRAN 4 according to the preferred embodiment of the present invention.

According to Fig. 3, the MS 1 comprises an input means 10 for inputting a higher layer message to be transmitted via the
35 radio interface of the UTRAN 4 and the Iu interface to an

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independent CN node such as the MSC 5. Such a higher layer message could be a setup request for a service provided by the MSC 5.

5 Furthermore, a setting means 11 is provided to which an information derived from the higher layer message is supplied from the input means 10 as to whether the connected CN node requires a position information, or not. In response to this information, the setting means 11 supplies an instruction to
10 a message generating means 12 so as to correspondingly set the position information control field of the RRC message generated by the message generating means 12 on the basis of the higher layer message or PDU supplied from the input means 10.

15 Optionally, a measurement means 13 may be provided for supplying a position measurement report to a generating means 12, wherein the position measurement report is incorporated at a corresponding field in the RRC message, if the position
20 information is required.

Finally a transmitter Tx 14 is connected to the message generating means 12 so as to transmit the generated RRC message via the radio interface.

25

The transmitted RRC message is received by the BS 2 of the UTRAN 4 and supplied to the RNC 3, as previously described in connection with Fig. 1.

30 In the following, the operation of the RNC 3 shown in Fig. 3 is described with reference to the flow diagram shown in Fig. 4, wherein an RRC Direct Transfer message including a higher layer PDU is transmitted to the RNC 3.

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The RRC Direct Transfer message including the higher layer PDU for the CN node is received by a receiver Rx 31 of the RNC 3 (step S101). Thereafter, the position information control field of the RRC message is checked by a checking means 32 connected to the Rx 31 (S102). Then, the received RRC message is supplied to a combining means 34. If the checking performed in the checking means 32 reveals in step S103 that no position information is required, the higher layer message (higher layer PDU) is supplied to a transmitter Tx 35 and sent to the desired CN node via the Iu interface in a transparent manner using the DTAP protocol (S104).

Otherwise, if the checking means 32 determines that a position information is required at the CN node, a corresponding information is supplied by the checking means 32 to a determining means 33 which is arranged to determine the position information.

Subsequently, the determining means 33 calculates the position of the transmitting MS 1 using the position measurement report included in the RRC message (step S105). Alternatively, the position information may be calculated or determined based on a corresponding position information of the MS 1 provided in the RNC 3.

Thereafter, the determining means 33 supplies the determined position information to the combining means 34, where the position information is combined with or added to the higher layer message so as to generate a Iu interface message (step S106). Thus, the Iu interface message corresponds to a complete layer 3 information.

Finally, the generated Iu interface message is sent by the Tx 35 to the desired CN node (S107).

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Accordingly, a position information can be transmitted via the UTRAN 4 of the UMTS without requiring major changes of the radio interface messages, i.e. the RRC messages.

- Essentially, only one bit has to be added as a new parameter to each RRC message carrying a higher layer PDU on the radio interface. Alternatively, the position information control field may consist of more than one bit, if e.g. several accuracy levels are provided for the position information.
- It is to be pointed out, that the transmission method and system described in the preferred embodiment is not restricted to the UTRAN of a UMTS, but can be used in connection with any mobile communication network where a higher layer message is to be carried on a radio interface message which does not include any position information. The above description of the preferred embodiment and the accompanying drawings are only intended to illustrate the present invention. The preferred embodiment of the invention may vary within the scope of the attached claims.
- In summary, a method and system for transmitting a position information from a mobile terminal of a mobile communication network via a network element to a network node is described, wherein a control information indicating the requirement of a position information of the mobile terminal at the network node is set in the radio interface message. This control information is checked at the network element as to whether a position information has to be forwarded or not. The position information is determined at the network element and may be combined with a higher layer information so as to generate a complete higher layer information to be forwarded to the network node. Thereby, the position information can be supplied to the network node without substantially increasing overhead and processing power required for the radio interface message.

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Claims

1. A method for transmitting a position information of a
5 mobile terminal (1) of a mobile communication network to a
network node (5, 6) using an intermediate network element
(3), comprising the steps of:
 - a) setting a control information in a radio interface
message, which indicates the requirement of said position
10 information of said mobile terminal at said network node;
 - b) transmitting said radio interface message to said network
element;
 - c) checking said control information at said network element;
and
 - 15 d) determining and forwarding said position information to
said network node in response to the result of said checking
step.
2. A method according to claim 1, further comprising the step
20 of incorporating a higher layer information into said radio
interface message, and forwarding said position information
together with said higher layer information to said network
node.
- 25 3. A method according to claim 1 or 2, wherein said control
information is provided in a control field used for signaling
the requirement of said position information.
4. A method according to claim 3, wherein said control field
30 has a length of one bit.
5. A method according to claim 3, wherein said control field
has a length of more than one bit, each value of said control
field referring to an accuracy level of said position
35 information.

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6. A method according to any one of claims 1 to 5, further comprising the steps of incorporating a position measurement information into said radio interface message before said
5 transmission step, and determining said position information on the basis of said position measurement information.

7. A method according to any one of claims 2 to 6, wherein said higher layer information is transmitted in a transparent
10 mode to said network node, when said checking step reveals that no position information is required.

8. A method according to any one of the preceding claims, wherein said network element is a radio network controller
15 (3) of said mobile communication network, and wherein said setting step is performed in said mobile terminal.

9. A method according to any one of the preceding claims, wherein said mobile communication network is a radio access
20 network of the UMTS, and wherein said network node is a mobile switching center (5) or a serving GPRS support node (6).

10. A system for transmitting a position information of a
25 mobile terminal (1) of a mobile communication network to a network node (5, 6) using an intermediate network element (3),

a) wherein said mobile terminal (1) comprises:
setting means (11) for setting a control information in a
30 radio interface message, which indicates the requirement of said position information of said mobile terminal (1) at said network node (5, 6); and
transmitting means (14) for transmitting said radio interface message to said network element (3); and

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b) wherein said network element (3) comprises:
checking means (32) for checking said control information;
determining means (33) for determining said position
information in response to the checking result of said
5 checking means (32).

11. A system according to claim 10, wherein said mobile
terminal (1) comprises a message generating means (12) for
incorporating a higher layer information into said radio
10 interface message; and wherein said network element (3)
comprises combining means (34) for combining said position
information with said higher layer information in response to
said checking result.

12. A system according to claim 11, wherein said message
generating means (12) is arranged to incorporate a position
measurement information into said radio interface message,
and wherein said determining means (33) is arranged to
determine said position information on the basis of said
20 position measurement information.

13. A system according to any one of claims 10 or 12, wherein
said network element is a radio network controller (3) of
said mobile communication network (4).

25

14. A system according to any one of claims 10 to 13, wherein
said mobile communication network is a radio access network
(4) of the UMTS, and wherein said network node is a mobile
switching center (5) or a serving GPRS support node (6).

30

15. A mobile terminal for transmitting a radio interface
message via a network element (3) to a network node (5, 6),
comprising:

- 15 -

- a) setting means (11) for setting a control information in said radio interface message, which indicates the requirement of a position information of said mobile terminal (1) at said network node (5, 6); and
- 5 b) a transmitting means (14) for transmitting said radio interface message to said network element (3).
16. A mobile terminal according to claim 15, further comprising message generating means (12) for incorporating a
10 higher layer information into said radio interface message.
17. A mobile terminal according to claim 16, wherein said message generating means (12) is arranged to incorporate a position measurement information into said radio interface
15 message.
18. A network element for forwarding a position information of a mobile terminal (1) to a network node (5, 6), comprising:
- 20 a) checking means (32) for checking a control information provided in a radio interface message received from said mobile terminal (1); and
- b) determining means (33) for determining said position information in response to the checking result of said
25 checking means (32).
19. A network element according to claim 18, further comprising combining means (34) for combining said position information of said mobile terminal (1) with a higher layer
30 information, to be forwarded to said network node (5, 6), in response to said checking result.
20. A network element according to claim 18 or 19, wherein said determining means (33) determines said position

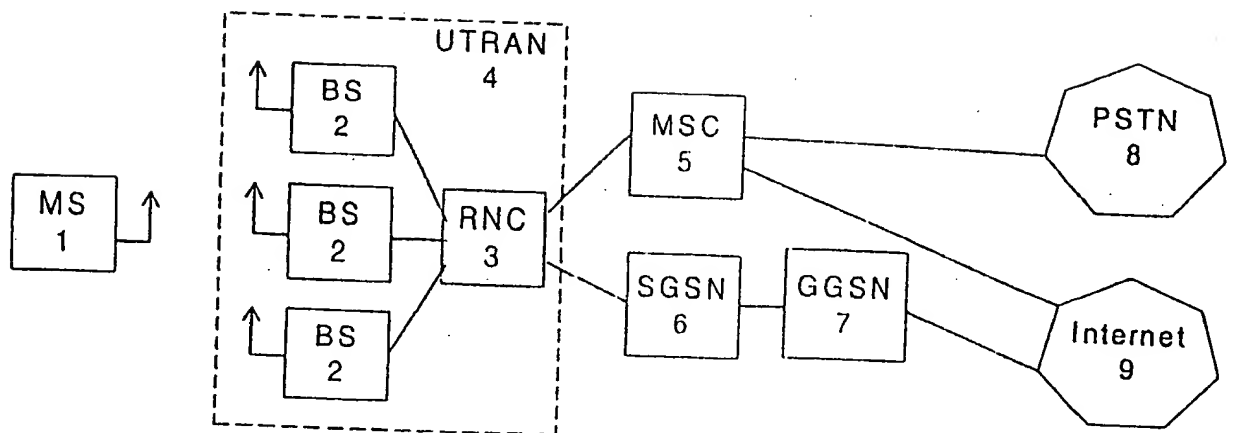
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information on the basis of a position measurement information included in said received radio interface message.

- 5 21. A network element according to any one of claims 18 to 20, wherein said network element is a radio network controller (3) of a radio access network of the UMTS, and wherein said network node is a mobile switching center (5) or a serving GPRS support node (6).

10

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**Fig. 1**

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RRC Direct Transfer message

Message type	CN id	Pos. info control field	Position measurement report	PDU
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Fig. 2

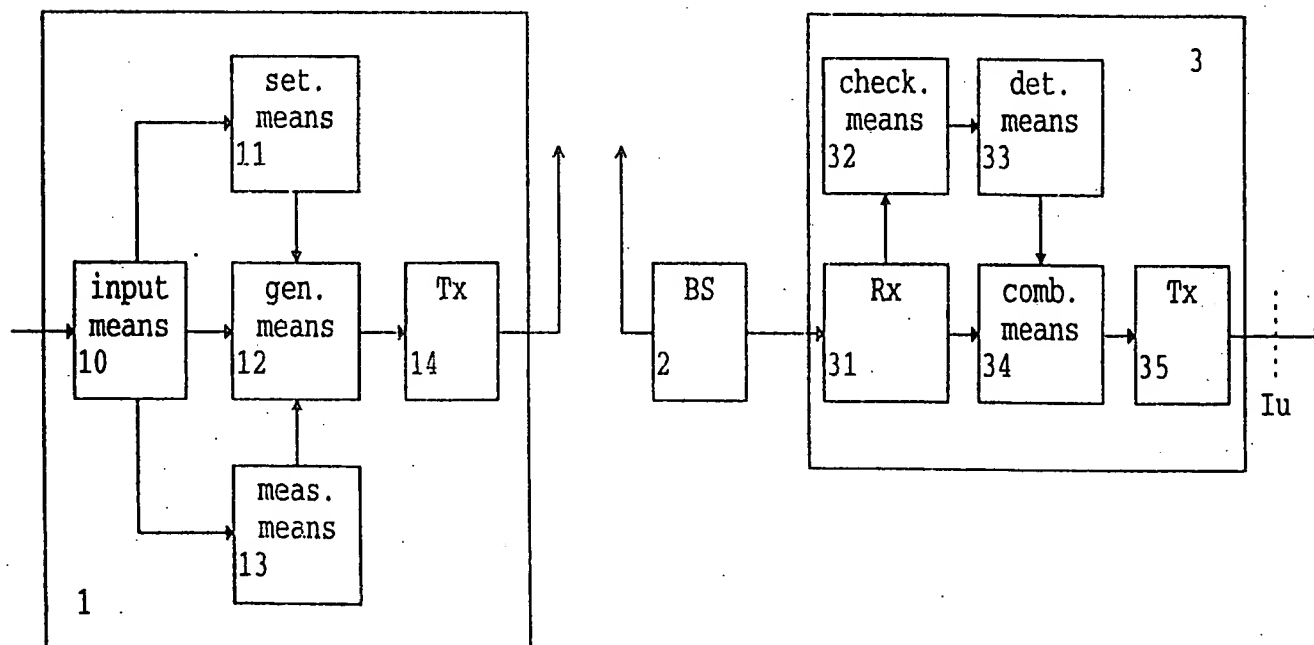


Fig. 3

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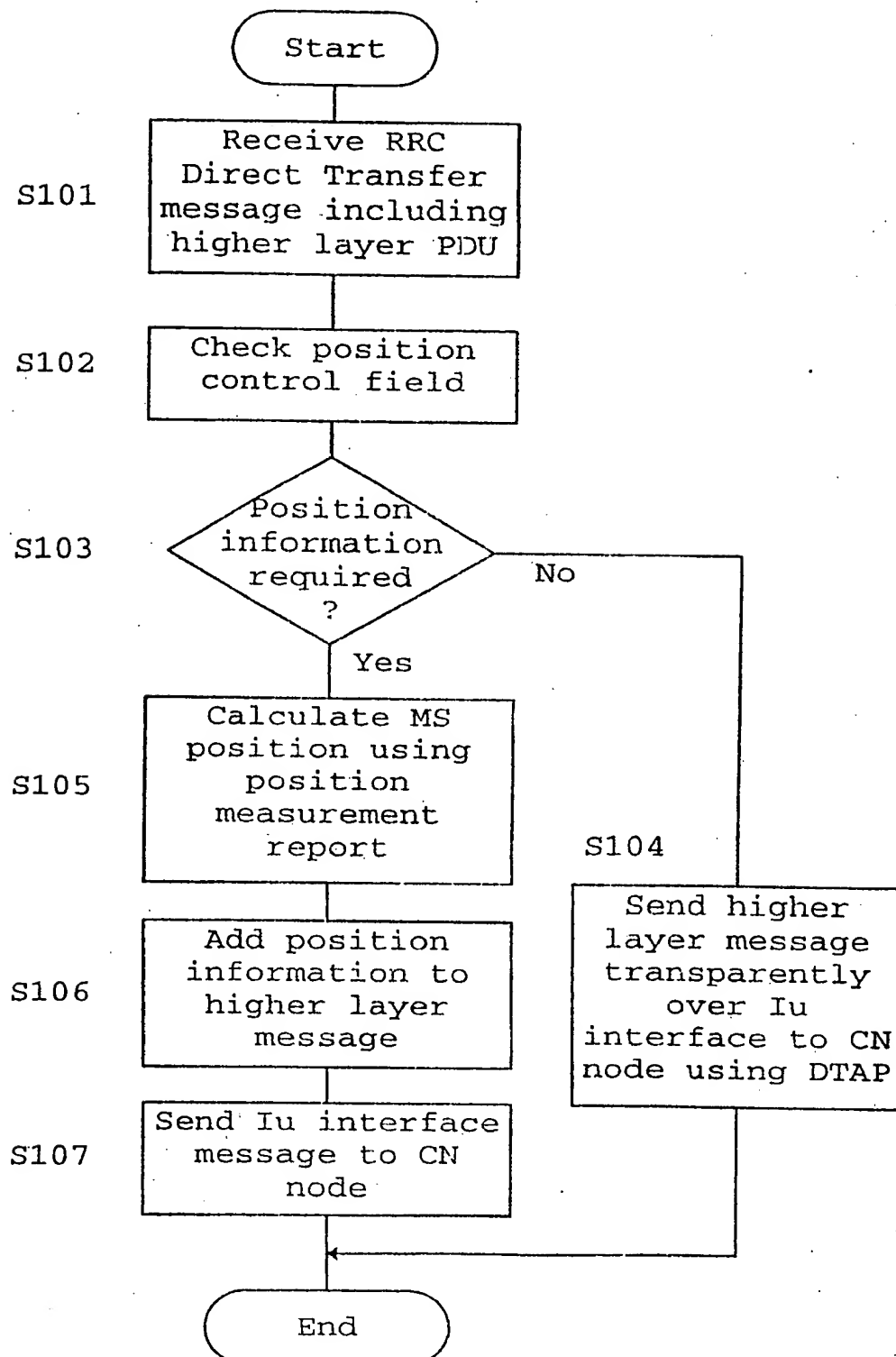


Fig. 4

INTERNATIONAL SEARCH REPORT

Int lonal Application No

PCT/EP 98/08065

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 H04Q7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5 754 955 A (EKBATANI MEHRDAD) 19 May 1998 (1998-05-19) column 6, line 42 - line 54; claim 4	1, 10, 15, 18
A	EP 0 805 609 A (HEWLETT PACKARD CO) 5 November 1997 (1997-11-05) column 13, line 19 - column 15, line 4	1, 10, 15, 18
A	EP 0 546 758 A (MOTOROLA INC) 16 June 1993 (1993-06-16) column 4, line 16 - line 31 column 7, line 33 - line 44 column 9, line 6 - line 24; figure 7	1, 10, 15, 18

☐ Further documents are listed in the continuation of box C.



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Date of the actual completion of the international search

10 August 1999

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP 98/08065

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